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(54) Method for automatic washing of motor vehicles, and automatic device for the execution thereof.

(57) A method is described for the automatic washing of motor vehicles, involving a non-contact sensing in order to procure the measurments of the contour of the vehicle to be washed. The measurements are stored and relayed to a control means for positioning the washing equipment relative to the vehicle.

A non-contact measurement of the length of the vehicle is carried out. Thereafter the side distance is measured, also without contact, between the washing equipment and the vehicle, and the desired optimal direction towards and distance to the vehicle is registered. The side contour of the vehicle is scanned and the measurements obtained are stored.

The stored data is used for positioning the washing equipment in a start position, after which said washing equipment is moved relative to the vehicle. The washing equipment used is high pressure washing equipment.

An automatic vehicle washing device is also described which comprises a carriage (1) having one horizontal spray bar (7) and vertical spray bars (8, 9). Said bars have high pressure spray nozzles. In the washing device, there is a photoelectric cell system having two reciprocally adjacent transmitters and receivers. These will, when the vehicle breaks the light beams, provide signals which are evaluated and converted to control signals with which to control the washing equipment. Furthermore, there is a distance measuring system (23, 24), for example an ultrasonic system, for determining the distance betwe n each side of the vehicle and a fixed point in the side of the carriage.

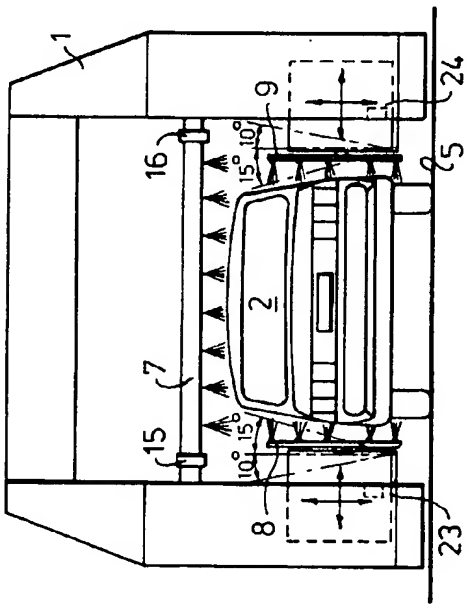

Fig.3.

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The invention relates to a method of automatically washing motor vehicles, as disclosed in the preamble in claim 1.

The invention also relates to an automatic car wash as disclosed in the preamble in claim 3.

In the generally known automatic washing system for vehicles of almost any kind, it is necessary to control the various pieces of equipment, such as spray nozzles or drying fans, in such a way that they conform with the contour or profile of the vehicle. In order to make this possible, the vehicle must be scanned and the signals obtained thereby must be converted to control signals for the driving mechanism of the equipment. In known systems, mechanical scanning usually takes place by means of rollers which come into contact with the body of the vehicle. Such mechanical sensors register the contour only at the points of contact and this results in a relatively large distance between the equipment and the vehicle.

However, the control of the equipment at one or several work stations, in particular fans, brushes and nozzles, or similar, in an automatic car wash system is known. Thus, a system is known wherein the work stations and the vehicle are moved in relation to one another and wherein a non-contacting sensor system is used to sense or scan the contour of the vehicle. The sensing system comprises a number of transmitters and receivers consisting of beam bars. These beam bars are broken by the vehicle and the receivers relay start signals via a coupling device to a driving mechanism for positioning the equipment.

In such a known washing system, eg, the system known from DE-OS 30 05 493, the sensor system in the work station is connected to the equipment and is moved with this. The interruption of the beams causes a control of the equipment in the respective position to be assumed. Experience has shown that a system of this kind is easily disturbed in its function owing to the presence of dirt and water particles.

To avoid the disadvantages which such disturbing environmental factors, as for instance dirt, dust and/or moisture, cause and which it cannot be hoped to avoid finding in a washing system or device for vehicles, a sensor system is proposed in DE 32 08 527 C2 which is in the form of several, and at least one row of monitored beam bars arranged above and serially coupled to another and transverse to the relative direction of movement for the vehicle and the respective pieces of equipment. The measurements thus obtained by sensing, which are typical for the position of the individual contour points, go into a memory and the measurements are used for controlling the equipment so that it is positioned relative to the vehicle.

Only one scan is carried out, ven though there may be a plurality of successive work stations, and the scan is carried out at the start of the system, ie, an area where there are no disturbing elements. Thus only one scanning means is needed, which is positioned in an area outside the zone where dirt and water particles are thrown into space from the various kinds of nozzles, brushes and fans. Th contour of the vehicle is stored during the scanning and this stored content is transferred thus to its respective work station when the vehicle reaches it, and is used to control the movement of the respective pieces of equipment synchronously with the relative movement of the vehicle.

The object of the present invention is, with the above-outlined prior art as its starting point, to combine advantageous features from this in a new way so as to obtain a compact, user friendly system, of relatively simple structure; and a special object of the invention is to provide a new method and a new system designed for the use of high pressure spraying, with the advantages that this brings about in terms of both environmental desirability and energy saving, as well as washing time and efficiency.

In connection with high pressure spraying, in order to achieve a satisfactory result it is important that the spraying is carried out in an optimal way. Important parameters here are distance, angle, beam overlapping (spraying pattern) and also, of course, water pressure, the amount of water used, and the quality and consistence of the chemicals used, and the time needed for them to take effect.

According to the invention, a method is therefore proposed, as mentioned by way of introduction, having the characteristics highlighted in the independent method claim.

Similarly, according to the invention, a device for washing vehicles is suggested as is disclosed in the introduction, having the characteristics which are recited in the characterizing clause of the independent apparatus claim.

By means of the invention, a compact system is achieved. The scan is made possible in a phase where dirt and water particles would not have a disturbing effect, and the individual high pressure nozzles used are guided into optimal positions in relation to the vehicle. Full utilization of the advantages provided by high pressure spraying is thus obtained. The washing time is also considerably reduced because the period of time in the system is put to best possible use. The new method and the new system will be environmentally friendly because of the high pressure spraying (reduced water consumption and external waste); furthermore there is a reduction in energy consumption.

The invention shall now be explained in more detail with reference to the diagrams, in which:

Figure 1: shows a top plan view of the car wash according to the invention

Figure 2: shows a side view of the device

Figur 3: shows an end view of th device

Figure 4: shows a side view as in figure 2, with the actual car wash or wash carriag in movement

during a washing cycle, and

Figure 5: shows an nd view of a somewhat modified car wash according to the invention.

Th device has, in a known way, per se, a carriage or frame 1 which can be moved backwards and forwards in th longitudinal direction of the car 2 shown, said carriage running on rails 3, 4 in the floor 5.

In the wash carriage 1 a horizontal spray bar 7 is provided. It is, as depicted in figure 2, mounted in the carriage in such a way that it can be raised and lowered, as well as rotated around its horizontal longitudinal axis, which is transverse to the longitudinal axis of the car. As a result of the movement possibilities, the spray bar 7 can assume desired positions relative to the car 2 when the carriage 1 is moved to the right in figure 2, and thereafter to the left and is thus guided past and over the vehicle. This is illustrated in figure 2 in that the spray bar 7 is drawn in relative to the vehicle 2, and that many of the possible positions which the spray bar assumes when the carriage 1 passes over the vehicle 2 are indicated.

For washing the sides of the vehicle, there are mounted in the wash carriage 1, two vertical spray bars, marked 8 and 9 respectively. These vertical spray bars 8, 9 are mounted in carriage 1 so that they can be moved towards and away from the sides of the vehicle, vertically up and down, and can be rotated around the horizontal centre axis. Further, the vertical spray bars 8, 9 can also be tipped or tilted towards and away from the respective side surfaces of the car, as is shown by means of the dotted lines and the indication of angles in figure 3.

The spray bar 7 also functions as a measuring bar, it being equipped with two brackets 15, 16 which each carry a measuring head 17, 18. Each measuring head has four photoelectric cells 19, 20, 21, 22. Said two measuring heads 17, 18 and their respective photoelectric cells 19, 20, 21 22 lie horizontally above one another and thus light beam go between them. These light beams works as sensors transverse to the longitudinal axis of the vehicle or car 2 the dimensions of which are to be sensed. When one or several light beam are broken, signals are provided which via suitable evaluation couplings are converted into control signals. These control signals are stored in an expedient fashion and are used for the control and positioning of the spray bar. In this connection, we are dealing with equipment which is known, per se, for a person who is skilled in the art. More detailed information about equipment of this kind can be found, inter alia, in DE 30 05 493 A1, and of interest in this connection is also the description which is given in DE 32 08 527 C2.

For measuring the side distances, ultrasonic quipm nt is us d, here just indicated by the rectangular boxes 23, 24.

The spray bar 7 comprises a high pressure cable, which is not illustrated, having a plurality of nozzles 25. Moreover, a soap applicator pipe 26 is incorporat d in said bar, and the spray bar 7 is also structurally combined with a dryer bar 27.

More details concerning th high pressure cabl , soap applicator pipe and spray bar are not shown, as these are all known components, per se, for a person who is skilled in the art. Important in this connection is only that, in particular, the high pressure nozzles 25 and dryer bar 27 can be controlled and positioned by the use of data provided by the scan which is carried out by means of the photoelectric cell heads 17, 18.

The ultrasonic equipment 23, 24 is used for measuring the side distance and in addition provides information of any maladjustment in the position in the carriage. The signals provided in this way also are stored and used for controlling the respective vertical spray bars 8 and 9. Said vertical spray bars 8, 9 are mounted in the carriage so that they can be moved towards and away from the sides of the vehicle, vertically up and down, and can also be rotated about horizontal centre axes. Further, said vertical spray bars 8, 9 can also be tipped or tilted towards and away from the respective side surfaces of the vehicle as is shown by means of the dotted lines and the angles indicated in figure 3.

In figure 5, a second vertical spray bar assembly is shown. At each inner side of the carriage is arranged an optionally articulated vertical spray bar 10, 11. Each of these is mounted in the carriage in such a way that they can be moved in the transverse direction of the car, towards and away from the respective side surfaces of the car. The optional bar members 12, 13 make possible an adjustment to the transverse profile of the car, such as is shown in figure 5, but the bars 10, 11 can also be straight, that is like the bars 8, 9, only longer, i.e., with a greater reach in height.

The vertical spray bar assembly 10, 11 can be used instead of the vertical spray bar assembly 8, 9, but can also be optionally combined with this, i.e., that both vertical spray bar assemblies are in one and the same carriage 1. The vertical spray bars 8, 9 can then for instance be arranged at the side of the vertical spray bars 10, 11, or possibly arranged beneath them, as spray bars 10, 11 in figure 5 are raised somewhat higher than the position they are shown in in figure 5, so that underneath, i.e., above the low parts of the side of the car, there will be room for the rotating spray bars 8, 9. The particular form of the spray bar assembly is, of course, not of decisive significance in connection with the present invention and a person skilled in the art would stand relatively free with regard to suitable embodiments.

The purpose of the measuring equipment, i.e., the photoelectric cell heads 17, 18 is to carry out a scan of the profile/contour of the car in the longitudinal direction, memorizing and evaulating/registering relevant profil measurements which are then used for

controlling the bar assembly 7. By means of the ultrasonic equipment 23, 24, th side surfaces of the car are scann d, that is the distance, for control and positioning of the vertical spray bars.

Scanning is carried out preferably with the vehicle stationary and the carriage in motion, but of course it would be possible to have a system that functioned in the opposite way, that which is essential being the relative movement between the vehicle and the carriage in the longitudinal direction of the vehicle.

A washing cycle may be executed in the following way:

The carriage 1 is in the start position, on the left in figure 1. The vehicle 2 is moved into position, the position as shown in figure 1. The washing device, i.e., the wash carriage 1 is moved towards the right, past and over the vehicle 2. During this movement, one of the ultrasonic devices 23 is activated, so that a side distance measurement is taken. A reading of the length of the vehicle is carried out simultaneously. These measurements are stored.

Thereafter the carriage 1 moves back to the left in figure 1, i.e., to the start position as shown. During this movement, soap is applied by means of the soap applicator pipe 26.

The carriage 1 then moves to the right once more, past and over the car 2, and during this movement a reading of the side profile of the vehicle is taken by using the photoelectric cell heads 17, 18. An ultrasonic measurement of the other side of the vehicle is made at the same time by means of the ultrasonic device 24. These measurements are stored.

The reason that the sides of the vehicle 2 are each measured individually in a separate movement past the car is that possible reciprocal disturbances between the ultrasonic devices 23, 24 are thereby avoided.

The carriage 1 then goes to the left yet again and during this movement a positioning is carried out with side movements, i.e., the vertical spray bars 8, 9; 10, 11 are positioned at the side by using the side distance measurements.

The carriage 1 returns thereafter to the right. Now a spraying under high pressure of the sides of the car is carried out by using the vertical spray bars.

The carriage then goes back to the left and high pressure spraying is carried out by means of the bar 7 and the nozzles 25. During this spraying, the bar 7 and its nozzles 25 are controlled by using the measurements which were read off during the first reading of the side profile, and the nozzles are guided by this at the correct distance and angle relative to the vehicle, such as is indicated in figure 2, where the spray bar 7 is shown in several selected, typical working positions relative to th stationary vehicle 2.

The carriage 1 then moves back once mor and rinsing is carried out with the addition of wax by using the spray bar.

The carriage goes back to the left yet again, and a so-call d draining takes place.

Thereafter, the carriage goes back once mor and rinsing with clean water takes place, with the possible addition of a decalcifying agent so as to thereby reduce the pH value. During the next movement of the carriage drying is carried out by using data, i.e., the bars are controlled by using the data that has been registered and stored.

The washing is now finished and a signal is given that the car may be driven out of the system.

Claims

1. A method of automatically washing a vehicle, wherein the side contour of the vehicle is scanned without-contact in order to provide measurements of said contour, said measurements provided by scanning are stored and relayed to a control means for positioning the washing equipment in relation to the vehicle, said washing equipment being moved in relation to the vehicle during the washing process, characterized in that the length of the vehicle is measured without contact, the side distances, washing equipment - vehicle, are measured without contact with the registration of the desired optimal direction towards and distance to the vehicle,
   the side contour of the vehicle is scanned,
   the registered/scanned measurements are stored,
   the stored data is used for positioning the relevant washing equipment in a start position and said washing equipment is then moved in relation to the vehicle, wherein the washing equipment used is high pressure washing equipment, and the washing equipment which is moved so as to conform with the registered side contour during movement in relation to the vehicle is continuously positioned in said desired direction and distance in relation to the vehicle.

2. The method according to claim 1, wherein first the length of the vehicle is determined, whilst the side distance, washing equipment - vehicle, is measured simultaneously, the measuring means being moved in relation to and over the vehicle, and wherein
   during a later movement past the vehicle, a reading of the side profile of the vehicle is taken by using a photoelectric cell system, whilst the distance on the other side is measured simultaneously, and
   that thereafter a high pressure spraying, rinsing and draining, etc, and drying are carried out by using the data registered and stored during the measuring and scanning.

3. An automatic vehicle washing devic comprising a carriage having a horizontal bar and vertical bars which carry the washing equipment, and scanning and controlling means for scanning the shape of the vehicle and controlling the bars with the washing equipment so as to conform with the scan, characterized by a horizontal bar having high pressure spray nozzles,
means for controlling the horizontal bar using the registered measurements in respect of distance and direction relative to the vehicle, and on each side of the vehicle a vertical bar having high pressure spray nozzles, a photoelectric cell system having two or more reciprocally adjacent transmitters and receivers which, as scanning means, transmit or receive light rays, the receivers are connected to an evaluating/coupling device which registers/evaluates the received start signals and transmits control signals for use in controlling the washing equipment, and further characterized by a distance measuring system for determining the respective distance between each side of the vehicle and a fixed point in the adjacent side of the carriage.

Fig.1.

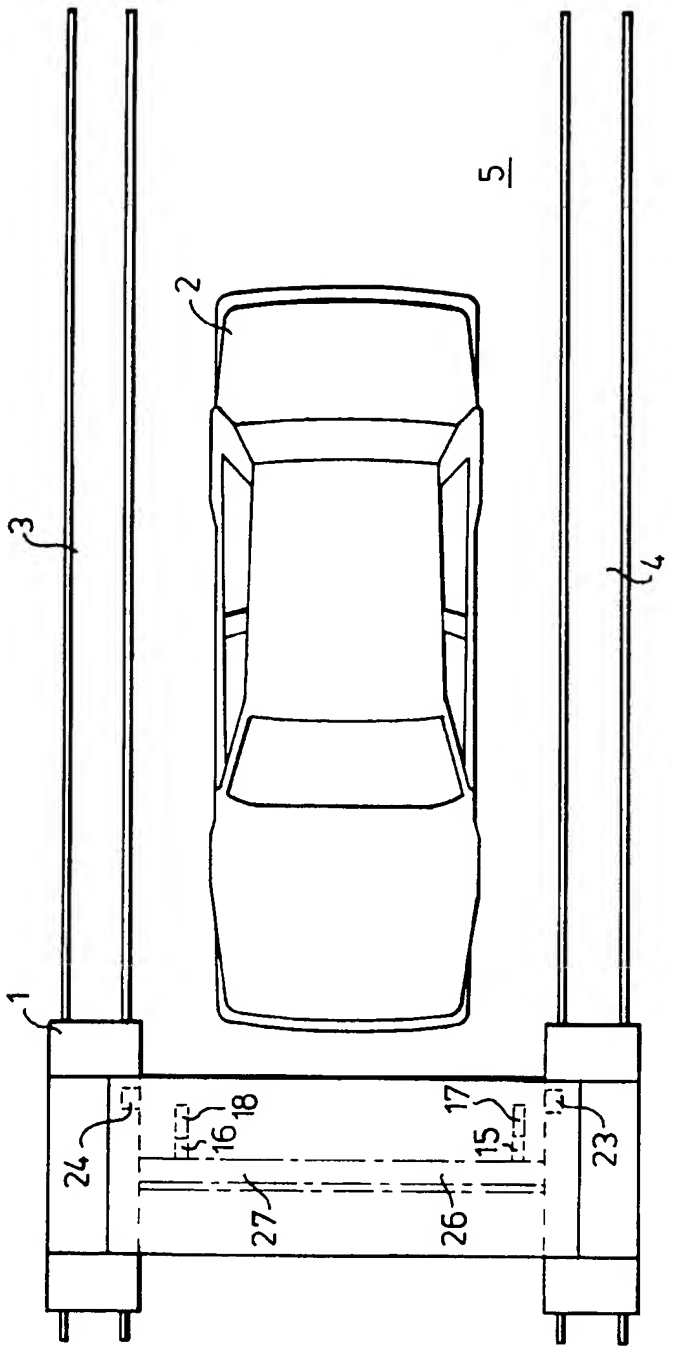


Fig.2.

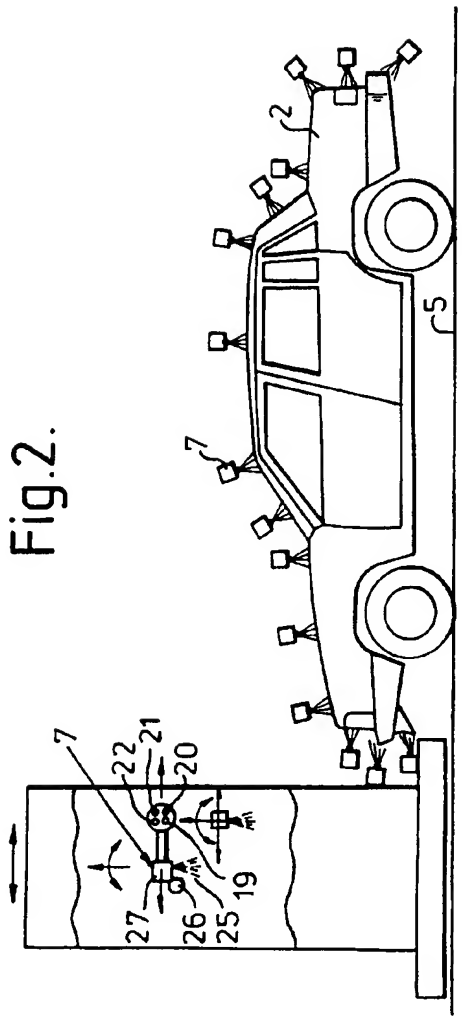


Fig.3.

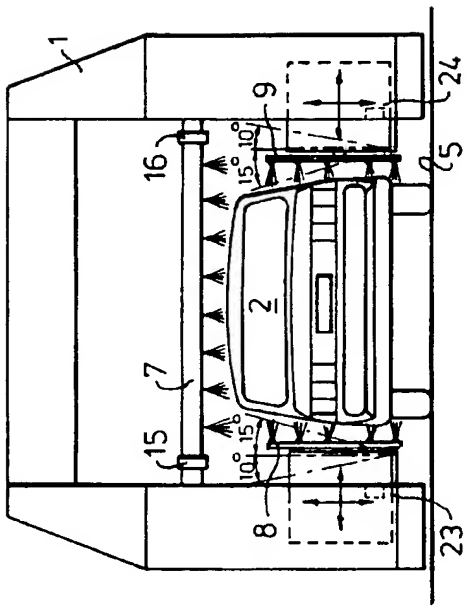


Fig.4.

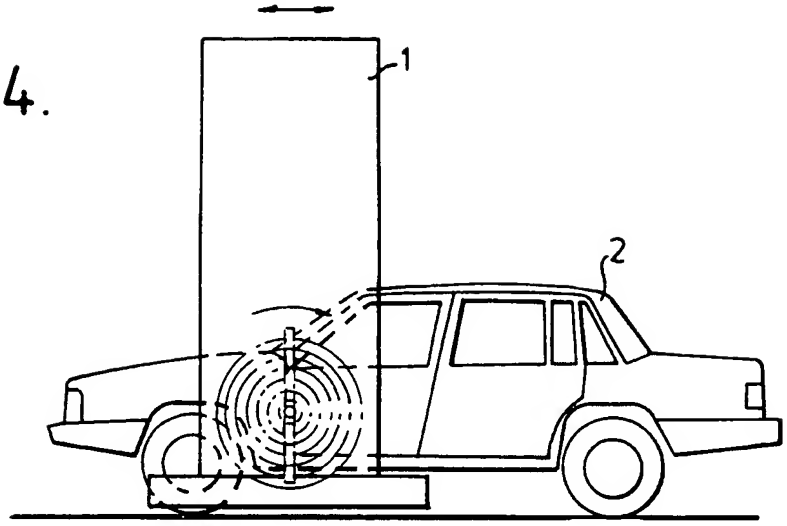
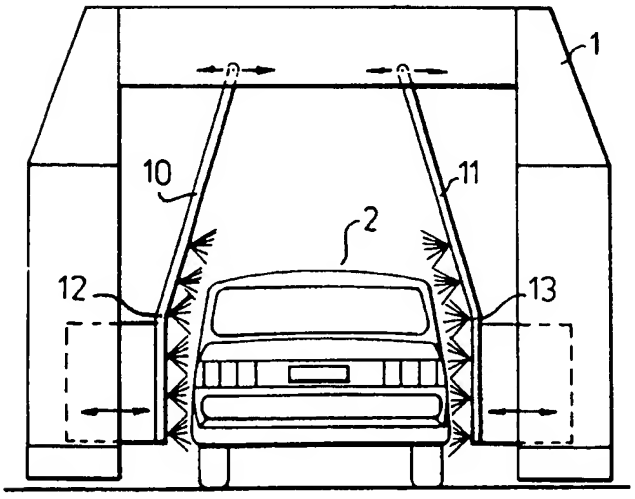


Fig.5.



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EUROPEAN SEARCH REPORT

Application Number

EP 92 85 0072

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X	EP-A-0 379 353 (CARLSON) * abstract; claims 1-6,16-19; figures 1-3,6 * * column 2, line 39 - column 3, line 16 * * column 5, line 44 - column 7, line 15 * * column 7, line 37 - column 9, line 1 *	1-3	B60S3/04
A,D	DE-A-3 208 527 (FRAUNHOFER GESELLSCHAFT ZUR FORDERUNG DER ANGEWANDTEN FORSCHUNG) * abstract; claims 1-3; figures 1-4 * * page 4, line 1 - line 12 * * page 5, line 11 - page 7, line 6 * * page 9, line 20 - page 11, line 30 *	1-3	
A	EP-A-0 302 964 (SHERMAN INDUSTRIES) * abstract; claims 1-7,11-17; figures 1-3,9,10 * * column 1, line 43 - column 3, line 17 * * column 4, line 48 - column 8, line 58 * * column 11, line 19 - column 16, line 4 *	1-3	
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			B60S

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	23 JUNE 1992	WESTLAND P.G.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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